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of the State. The contribution of fertilizer to the total agricultural production stands third in all the districts except for Karnal where it stands second.

APPENDIX

LOG LINEAR FUNCTIONS

District	Constant (a)	Regression coefficients				R^2
		Agricultural extension investment $x_1(b_1)$	Fertilizer consumption $x_2(b_2)$	Gross area irrigated $x_3(b_3)$	Total cropped area $x_4(b_4)$	
Hissar	1·0007	0·2027 (0·3211)	0·2895 (0·2854)	0·6862 (1·5502)	—0·3522 (0·0025)	0·9095
Rohtak	0·1894	0·1298 (0·3160)	0·1569 (0·4454)	0·9389 (0·6708)	0·0025 (0·0367)	0·9489
Karnal	0·1197	0·2551 (0·1938)	0·1698 (0·1265)	4·5912 (2·8954)	4·3692 (2·5295)	0·9998
Ambala	1·0000	0·0235 (0·2867)	—0·2502 (0·4677)	0·7440 (0·9665)	0·4576 (0·5319)	0·8895
Jind	562·3400	0·0478 (0·1103)	—0·4641 (0·1103)	—0·2032 (0·0960)	—0·0946 (0·1477)	0·9998
Gurgaon	18·5730	0·7304 (0·1519)	—0·0064 (0·0509)	0·0230 (0·0505)	—0·4952 (0·3580)	0·9882
Mohindergarh ..	1·0012	1·5582 (3·4103)	0·3328 (0·4305)	—2·0938 (3·4531)	0·0009 (0·0021)	0·8302

Figures in parentheses indicate standard errors.

RETURNS FROM INVESTMENT IN EXTENSION SERVICE IN AGRICULTURE

Daulat Singh, Ram Iqbal Singh and V. K. Singh*

Genesis of Extension Services

Soon after Independence the country realised the need of increasing agricultural production with a view to mobilizing farm and rural industrial resources for economic development. This necessitated the establishment of a permanent administrative set-up for rural reconstruction. Several measures were undertaken, here and there, for bringing about quick increases in agricultural and industrial production, but only a few could succeed for one reason or the other. Later this led to the emergence of a nation-wide Community Development (CD) Programme and National Extension Service (NES) encompassing the whole country into its realm of activities in agriculture, animal husbandry and rural welfare. A three-tier administrative structure at district, block and village level took shape in all the States in which administrative control rested at district and technical expertise at the block level. A field level

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force of village level workers was put into service under subject matter specialists in each block. The responsibility of co-ordination rested with the Block Development Officer. Ex-officio positions were created in view of decentralisation of powers and active public participation. Since the inception of the CD Programme both extensive and intensive approaches were followed, but due to scarce resources dispersed over larger areas in the early years, much headway could not be made in raising production. Hence, the Intensive Agricultural District Programme (IADP) and Intensive Agricultural Area Programme were introduced. In order to give added attention towards weaker sections some specific programmes, like SFDA, MFAL, Area/Command Area/Whole Village Development Programmes, Drought-Prone Area Programme, etc., have been launched during the third, fourth and fifth Five-Year Plan periods.

This historical background leads us to conclude that the organization, scope, objectives and working methods of extension services varied over time and according to the priority set forth. However, the basic task of extension services remained more or less the same with an emphasis on increasing crop/ animal productivity through the transfer of technically feasible and economically viable technologies. Programmes and policies were modified from time to time to curb imbalances in the socio-economic conditions of various sectors of the population. Thus on the basis of historical developments the extension service in India may be conveniently described for the purpose of analysis in this paper, as under:

"Extension service is an organization imbibing techno-economic and administrative hierarchy for socio-economic development of rural communities". Here service includes the educational aspects of extension also.

The task of correct estimation of socio-economic benefit on extension is formidable, both conceptually and methodologically; however, on the basis of experiences the distinguishing features of the responses of the society to the investment in extension vis-a-vis economic input have been examined in this paper.

Concept of Extension Service Input and Its Path Diversion from Economic Input

In the case of economic analysis a marginal concept is usually applied which is based on returns to the addition of one unit of input in the process. The same approach is adopted when the returns to scale are examined. But several studies conducted in foreign countries as well as in India clearly highlight the nature and behaviour of extension input in diversified socio-economic environments. Singh and Akhouri[1] working in Kanjanwala village in Delhi, Ragbir Singh[2], Dhaliwal and Sohal[3] and Rogers and Svenning[4] have con-

1. K. N. Singh and M. M. P. Akhouri, "Relationship between Farmers' Background and Knowledge Gained through Different Teaching Methods", *Indian Journal of Extension Education*, Vol. II, Nos. 1 and 2, March-June 1966, pp. 22-34.

2. Raghbir Singh: Adoption of Nitrogenous Fertilizers as related to Selected Factors and Use of Information Sources in Adoption Process, Ph.D. Thesis, Cornell University, Ithaca, New York, U.S.A., 1967.

3. A. J. S. Dhaliwal and T. S. Sohal: Extension Contacts in relation to Adoption of Agricultural Practices and SES of Farmers", *Indian Journal of Extension Education*, Vol. I, No. 1, March 1965, pp. 58-62.

4. E. M. Rogers and Lynne Svenning: Modernization among Peasants: The Impact of Communication, Holt, Rinehart & Winston, Inc., New York, U.S.A., 1969.

cluded that communities with higher social status, level of education, size of holding, social participation and developed means of communication respond better to extension education input, thereby the operative cost of the extension programme and net returns are relatively low in comparison to the investment of this input in the rural communities having low gamut of variables specified above. It means that the returns to extension input increase with the increase in the socio-economic structure of the society. The rate of increase in socio-economic returns may not be linear but substantial response surface will be covered under this trend followed by an increase in response at a decreasing rate. As the society grows the response to extension input will never be zero and will not show negative rate of return as usually observed in the case of economic input.
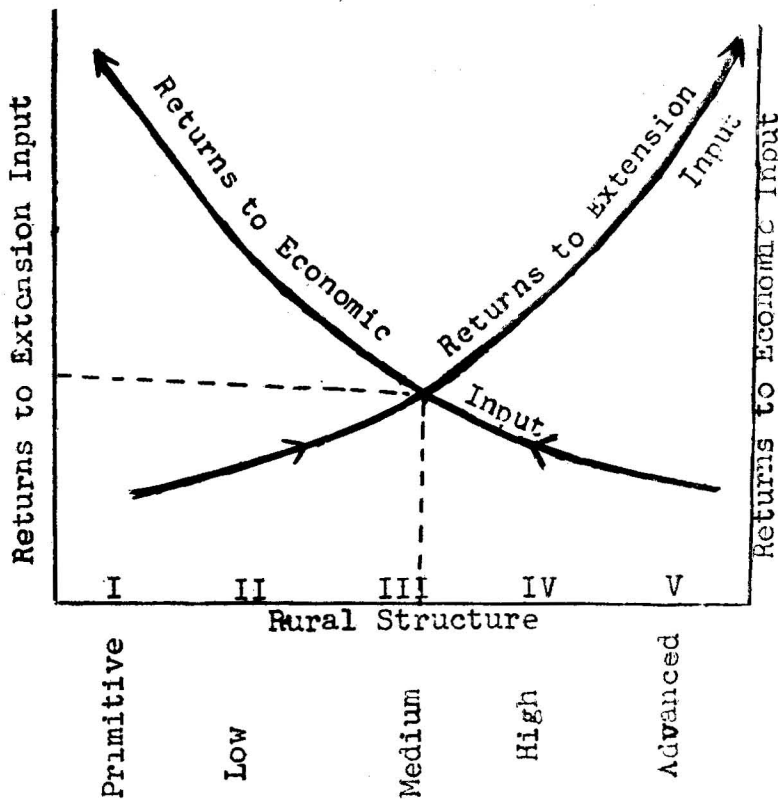

Figure 1—Path Diversion Curve

It is evident from the path diversion curve presented in Figure 1 that extension and economic response paths intersect each other somewhere at the point of medium rural structure. As the rural structure progresses the returns to extension input fall below the break-even point of both of these inputs. This pattern of response of rural structure to extension and economic inputs distinguishes the relative performance of extension and economic inputs when

the rural structure shows various stages of development. It is further evident from these paths that the returns to economic inputs are always higher in primitive societies when the total rural structure is unexplored and under-developed. When development takes place communities start aspirations for further progress. They search for alternatives which come through extension input. Thus, extension input starts playing a dominant role over economic input after the society has reached a minimum level of take-off stage.

Costs and Benefits of Extension Service Inputs

The contribution of extension service organization, as a whole, can amicably be predicted by the economic and social factors influencing the community and not by simple estimation of income accrued by physical factors, like money, material and technology. As in some situations the rate of return is determined by the economic factors and in others by the social factors. Therefore, the rate of return is not an inclusive effect of economic factors alone, specially when the resources are to be collected from various sources in addition to what the entrepreneurs already have. In agricultural extension work if a farmer has a poor mix of socio-economic factors of production which have made him socially poor, he will not have the higher rate of return to social variables in the initial stages, although he has more potential to absorb it later on.

Table I presents the cost-benefit analysis of agricultural extension work conducted in block Kalyanpur of district Kanpur (Uttar Pradesh) during 1976-79.

TABLE I—COST-BENEFIT ANALYSIS OF BLOCK LEVEL EXTENSION SERVICE IN AGRICULTURAL PRODUCTION

Period	Block staff expenditure (lakh Rs.)		Total	Level of production (metric tonnes)		Fertilizer uptake (metric tonnes)		
	Pay	Travelling allowance		Dwarf paddy	Mexican wheat	N	P	K
1976-77 ..	1·607	0·151	1·758	1,870	6,805	480	155	80
1977-78 ..	1·803	0·179	1·982	1,900	7,300	655	185	92
1978-79 ..	1·876	0·087	1·963	2,000	7,753	766	236	108
(a) Net increase in 1978-79 over 1976-77	0·269	(—)0·064	0·205	130	948	386	81	28
(b) Percentage increase ..	16·7	(—)42·3	11·6	69·5	139·3	59·5	42·2	35·0
(c) Average annual cost (lakh Rs.)			1·901	—	—	—	—	—
(d) Benefit in 1978-79 over 1976-77 (lakh Rs.)			—	1·170	10·802	1·720	1·215	0·28
(e) Aggregate cost-benefit ratio ..			1 : 11					

Prices of paddy, wheat and N,P,K fertilizers have been estimated at Rs. 900, Rs. 1,150, Rs. 2,000, Rs. 1,500 and Rs. 1,000 per metric ton, respectively.

It is evident from Table I that the aggregate cost-benefit ratio is 1 : 11 when costs and incomes of only rice, wheat and fertilizers have been taken into account. The opportunity cost of the investment on the block structure has also been examined and the benefits are found above the opportunity cost. If other benefits accruing from the investment in the block structure are also added, the cost-benefit ratio will be further widened indicating more profits from the investment in the block structure. Yet, this study has its own limitations where many important variables of production and income have been omitted due to paucity of reliable data.

Implications of the Findings

On the basis of the above findings following observations may be derived for policy implications.

(*a*) The entire rural structure should be distinguished on the basis of social and economic variables of development and economic inputs should be allowed to raise the primitive society to the level of break-even point of development. The extension input, though initiated along with the economic input, be given special emphasis after the break-even point of development or when the society reaches the take-off stage.

(*b*) The costs and benefits of extension input should be viewed in its totality and, therefore, all the field extension programmes must be evaluated at frequent intervals to assess the impact of these programmes, which will help guide the planning of extension, economic input mix.

A STUDY INTO THE NATURE AND IMPACT OF AGRICULTURAL EXTENSION IN THE PUNJAB STATE

A. J. Singh and B. S. Bhullar[*]

The need to establish effective systems of agricultural extension as instruments in the process of diffusion and adoption of new farm technology has undoubtedly been increasingly recognized in India in recent years. But, unfortunately, there has been rather inadequate awareness about the nature and magnitude of the extension services available to the farmers. Further, there is almost a total lack of evidence on the impact or contribution of extension input, although a large number of studies have attempted to examine the role of research in agricultural productivity. Notable among these are

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